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SOVIETS DEVELOP NEW AUTOMATICS FOR PRECISION MACHINE BUILDING

A. S. Pronikov

To develop transmitting mechanisms assuring high accuracy in automatics in conjunction with simple design and small dimensions, experimental and theoretical research was conducted at the laboratory of machine tools and automatics of the MTU (Moscow Higher Technical School) imeni Bauman.

On the basis of the results obtained from this research, a number of new-design automatics for precision machine building were developed. Participating in the design, manufacture, and testing of these automatics, under the leadership of Professor G. A. Shaumyan, Doctor of Technical Sciences and Stalin Prize winner, were Docent A. Ya. Zagorodnikov, Candidate of Technical Sciences; Docent N. I. Kamyshnyy, Candidate of Technical Sciences; V. S. Kiselev, senior engineer-designer; L. V. Filimonov (deceased), engineer; S. P. Alechin, head of the laboratory; A. I. Lobanov, mechanic; Docent A. S. Pronikov, Candidate of Technical Sciences and author of this article; and others.

The transmitting mechanism in the new automatics is a ball-type drive (sharikovyy privod). This drive is composed of two forward-moving plungers between which balls and spherical washers are enclosed in a tubing filled with a lubricant. The driving plunger receives motion from a cam and transmits it through the ball drive to the driven plunger and the tool slide. The return stroke of the tool slide, as in most automatics, is accomplished by means of a spring.

To avoid a deviation in the speed of the tool slide in relation to the driving plunger during the movement of the balls through the bend of the tubing, the radius of curvature of the tubing must be at least five times the diameter of the balls. In addition to this, the deviation of speed of the driven plunger from the speed of the driving plunger does not exceed 2 percent, which is considerably less than in transmitting mechanisms of existing automatics, where it reaches 30 percent and even more.

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The washers, located between the balls, increase the supporting surfaces of the balls, assuring greater rigidity of the transmitting mechanism.

Another type of transmitting mechanism is the bellows-type drive. This consists of two corrugated boxes connected by a tubing and filled with a lubricant. With the compression of one of the bellows by means of a cam of the camshaft, the other bellows expands and transmits movement to the tool slide through a plunger.

Both transmitting mechanisms have similar dimensions. However, the ball drive is preferred in the manufacture of automatics, since the operation of the bellows drive under plant conditions is complicated.

One automatic, Type GASH-12, is intended for machining precision parts for watch mechanisms.

On the basis of the above automatic (with a replacement of 10 percent of the parts) a semiautomatic, Type GASH-14, has been manufactured. This semiautomatic is intended for finishing the balances of watches and other precision parts. In the GASH-14, the loading of parts is done by hand because the thinness of the part might cause breakage if an inserting mechanism were used.

Automatics designed and manufactured by the MVTU since 1948 are being successfully used at the First and Second State Watch Plants.

The use of the automatic for preliminary, and the semiautomatic for finish machining of the balance ring, with resulting high productivity, precision, and decrease of rejects, has permitted the replacement of Swiss automatics at the First State Watch Plant. One GASH-12 automatic at the Second Watch Plant is replacing three machine tools, resulting in an increase in labor productivity and high machining precision.

The GASH-12 and GASH-14 are universal and can be easily set up for the manufacture of other parts by changing the feeding mechanism. A disk-type feeding mechanism is used for final finishing of the tips of the ball shaft (nakonechnikov sharikovoy ruchki). The blanks are placed on slotted pins of the feeding disk which rotates intermittently by means of a ratchet. A gripping device removes the blank from the pin of the disk and carries it to the spindle where it is clamped by a collet.

After the blank is clamped in the spindle, its taper is turned with the help of a former, and a 0.5-millimeter hole is centered and drilled in it. A special drill then faces and calibrates the hole to size.

The use of the GASH-12 automatic with the disk feeding mechanism has made automatic the process of final finishing of tips (nakonechnik) at the Leningrad Soyuz Plant.

For forming and longitudinal turning, a precision automatic, the GASH-11, with compound slide rest and spindle travel in an axial direction, has been designed and manufactured. The automatic can operate with either the ball-type or bellows-type transmitting mechanism. Maximum diameter of bar stock which can be used is 7 millimeters.

Special tests have been conducted on a type IIIa automatic installed at the laboratory to determine the possibility of using the ball-type mechanism in medium automatics. The test showed that this is possible.

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The MVTU automatics and transmitting mechanisms are opening new possibilities for the designing of automatic machines. The simplicity and compactness of these transmitting mechanisms and the possibility of transmitting movement in any direction permit the development, for the most diverse technological purposes, of automatics made up of standardized units and parts. This standardization reduces the cost and accelerates the construction of automatics.

The new principle of transmitting movement can be used not only in metal-cutting automatics but in automatics of other branches of industry (food, electro-vacuum, etc.), in automatics for assembly and erection, in instrument building, and for the automatization of machines.

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